

## Development of Worksheet based on Elicit Confront Identify Resolve Reinforce (ECIRR) for Grade XI Science High School Students

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### ABSTRACT

The curriculum 2013 requires students to be more active in the learning process. The case with physics learning carried out at SMA N 2 Batang Anai, it still focuses on learning from educators. Not only that, the use of teaching materials such as textbooks and worksheet has not been combined with learning models aimed at students, so that curriculum demands have not been achieved. One effort to overcome this is by developing elicit-based worksheets based on confront identify resolve reinforce for grade XI IPA students at SMA N 2 Batang Anai. The aim of the research is to produce valid and practical worksheet. The type of research used is Research and Development (R&D), with the ASSURE model consisting of stages (1) recognizing the character of potential users of teaching materials, (2) determining the competence and learning objectives, (3) designing teaching materials, (4) producing teaching materials, (5) involving students in using teaching materials and (6) evaluating and revising teaching materials, this model is also combined with the Evaluation Formative Tesser which consists of expert review, one-to-one, small group and field test stages. The subjects of this study were 1 teacher and 40 students in grade XI IPA SMA N 2 Batang Anai. The results of the validity test show that the developed worksheet is categorized as very valid with a percentage of 94.15%. The value of practicality by educators and students shows that the worksheet developed is categorized as very practical with a proportion of 90.24%. Based on these results, the worksheet with material on dynamics of rotation and balance of rigid bodies that has been developed is categorized as valid and practical. After obtaining a valid and practical product, the product is suitable for use in assisting the learning process.

### Introduction

Physics is a fundamental science that is the backbone for the development of science and technology. Physics is a lesson that provides knowledge about the universe to practice thinking and reasoning, through a person's reasoning abilities that are continuously trained so that it grows, then that person will increase his thinking power and knowledge (Supiyanto (2007 :1).

The application of physics in everyday life gives rise to several benefits, according to Harefa (2019 :5) The benefits of studying physics include the application of physics to the development and discovery of

technology, physics is also one of the basic sciences for the development of other sciences. Not only that, physics is also directly related to the environment, so that by studying physics, various benefits are obtained for real life.

The process of learning physics in schools should be in accordance with the nature of learning physics which demands direct learning experiences for students who are emphasized through an active role in discovering and building concepts based on what is obtained in their environment. As with the 2013 curriculum, it applies activity-based learning, which is expected to produce productive, creative, innovative

and affective Indonesian people through strengthening integrated attitudes, knowledge and skills (Kristanti 2016).

The implementation of assessments which include assessing attitudes, knowledge, and skills, which are carried out using various methods, including observation, project assessment, and portfolios. Implementation of the 2013 curriculum emphasizes authentic assessment of students covering aspects of attitude (spiritual and social), knowledge and skills so that it is hoped that the attitude aspects will develop together with the knowledge and skills aspects (Astuti 2018 :7). However, current physics learning often uses a learning approach that is only teacher-centered or still uses a learning system with the KTSP curriculum. In accordance with the demands of the current curriculum, the teacher-centered learning approach needs to be changed to a student-centered learning approach. The implementation of student-centered learning activities aims to involve students directly and increase student understanding.

The results of observations that have been made at SMA N 2 Batang Anai grade XI IPA found various problems, namely, in the learning process educators still use the lecture learning model. The learning media used such as worksheet and textbooks have not been designed according to the needs of students. The worksheet only contains material and general practice questions without any activities that students can do when the learning process and the language in the textbooks is difficult to understand, resulting in a lack of interest in reading textbooks for students.

Based on these observations, to overcome the problems above, a teaching material is needed that can help students understand physics learning and play an active role when learning takes place. The teaching materials developed in this study are in the form of worksheet, because the worksheet contains a series of activities and exercises that can facilitate and improve students' understanding of the subject matter. According to Prastowo (2014 : 269) worksheet is a printed teaching material that is used as a learning medium that contains materials, summaries, and instructions for implementing learning tasks that must be done by students. worksheet also contains a set of activities that will be carried out by students to improve their abilities in accordance with predetermined indicators.

In addition to teaching materials, the learning process also requires a learning model. One of the models that can be used by educators in the learning process is the ECIRR model. This model was chosen because this model puts forward the conceptual development of

students' learning, where students build their initial knowledge of themselves. According to Wenning (2008 :15) the ECIRR learning model has 5 stages, namely, elicit, confront, identify, and resolve reinforce.

Worksheet based on Elicit Confront Identification Resolve Reinforce was developed to assist educators in attracting students' interest to play an active role in discussing the material, in accordance with the characteristics of the ECIRR found in (Wenning 2008), namely this learning model focuses on student activities so that students can build initial abilities or conceptual understanding the students themselves. The use of worksheet in learning aims to make educators only as facilitators and also supervise student activities, with educator supervision, students know whether the initial concept is in accordance with the main concept of the material being studied. The developed worksheet is also adapted to the material to be studied. In line with Effendi (2016 :42) that the ECIRR model facilitates students to confront previously understood concepts with the phenomena being observed, so that students' learning motivation increases and in the end students can achieve good mastery of physics concepts

The material contained in the worksheet is KD 3.1 material on the dynamics of rotation and balance of rigid bodies. This material was raised because this material was difficult for students to understand. This material is categorized as difficult to understand due to several factors, namely: quite a lot of sub-material, this material includes discussions of translational motion and rotational motion of objects, educators rarely apply experimental and demonstration methods during the learning process, in carrying out experiments the tools and materials available are still small so causing students to only understand the material without understanding how it is applied in real life.

The selection of learning models in developing the right worksheet is needed in a good learning process. The selection of the ECIRR model is considered to be able to make physics learning more able to develop students' abilities. This model is also suitable to be applied to the material of rotational dynamics and rigid body balance. This is because this material has a lot to do with everyday life. Physics learning assisted by the use of elicit confront identify resolve reinforcer-based worksheets can improve students' critical thinking skills, so research on the development of ECIRR-based worksheets on the rotational dynamics and rigid body balance material needs to be done.

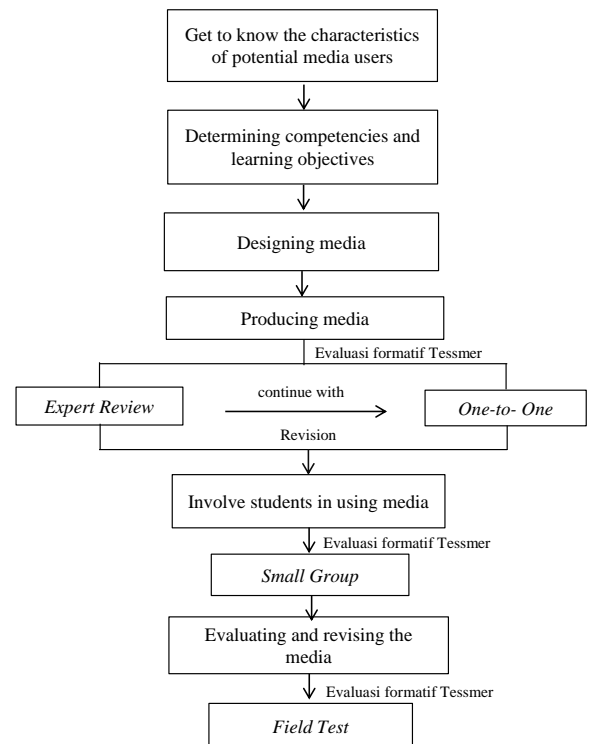
## Methods

The type of research used in the development of this worksheet is research and development (R&D). According to Sugiyono (2018 :407) Research and development methods are research methods used to produce certain products and test the effectiveness of these products. Meanwhile, according to Tritanto (2017) states that R&D is a research method for product development and product improvement. The worksheet was developed using the ASSURE research model. According to Iskandar (2020 : 1054) the ASSURE model is one model that helps in planning, identifying, determining goals, selecting models and materials and evaluating the right. Not only that, the ASSURE development model can help educators in combining types of media for the benefit of learning in the grade room. Therefore, in this study, the ASSURE development model was used.

The procedure used in this development research is the ASSURE development model combined with the Evaluation Formative Tessermer. The stages of developing the ASSURE model consist of six stages Pribadi (2019 :25), namely (1) recognizing the characteristics of prospective users of teaching materials (2) determining competencies and learning objectives, (3) designing teaching materials, (4) producing teaching materials. At this stage, it is carried out in accordance with the Evaluation Formative Tessermer stage, carried out by product testing on Expert reviews (validators), and one-to-one trials. (5) involve students in using teaching materials, at this stage the worksheet is tested into a small group (small group), (6) evaluates and revises teaching materials, at this stage the worksheet is tested into a field test. The flow of this research is as follows Figure 1.

The subjects of this study were 1 educator and 40 students of grade XI science. The research instrument used in this study consisted of a validation sheet, a practical sheet and an interview. The instrument used to determine the validity of the worksheet is a questionnaire validation sheet. The questionnaire used consists of several aspects, namely aspects of content feasibility, language and image aspects, presentation aspects, and graphic aspects. The worksheet based on Elicit Confront Identify Resolve Reinforce was validated by 3 physics education lecturers. The rating scale on the validation sheet uses a Likert scale modified by Riduwan (2012 : 87) with 5 alternative answers, STS (Strongly Disagree), TS (Disagree), N (Neutral), S (Agree), and SS (Strongly Agree).

**Figure 1**  
Research Procedure



Data analysis was carried out by analyzing all aspects assessed by each validator and respondent. To determine the percentage of validity using the Equation 1, proposed by Riduwan (2012 : 87). Criteria for product validity and practicality are shown in Table 1.

$$\text{score} = \frac{\text{total score}}{\text{maximum score}} \times 100\% \quad (1)$$

**Table 1**  
Criteria for Product Validity and Practicality

Intervals (%)	Category
$0 \leq \text{score} < 20$	Invalid/ Impractical
$20 \leq \text{score} < 40$	Less Valid / Less Practical
$40 \leq \text{score} < 60$	Sufficiently Valid/ Enough Practical
$60 \leq \text{score} < 80$	Valid/Practical
$80 \leq \text{score} < 100$	Very Valid/Very Practical

(Riduwan 2012 : 87)

The assessment of validity and practicality is determined based on the interpretation criteria of the scores obtained. Gradeification of the value of validity and practicality used in this study if it lies in the range of values 61-100%. If it lies in the range of values 0-60%, the product is revised again.

## Result and Discussions

Worksheet based on Elicit Confront Identify Resolve Reinforce applied to students of grade XI IPA SMA N 2 Batang Anai. The developed worksheet contains Basic Competencies (KD) 3.1 Apply the concepts of torque, moment of inertia, center of gravity and angular momentum on rigid bodies (static and dynamic) in daily life and KD 4.1 Plan and carry out center of gravity and rigid body balance experiments.

Worksheet development uses the ASSURE development design accompanied by Evaluation Formative Tessmer. The stages in this development research are as follows:

### a. *Getting to Know the Characters of Prospective Users of Teaching Materials*

At this stage, to get to know the character of prospective users of teaching materials, it is done by distributing a needs questionnaire. At this stage an analysis of the curriculum used, preliminary analysis of educators and students is carried out. Analysis of educators is carried out through interviews and giving initial questionnaires, the aspects analyzed include the learning resources used, the constraints of educators in learning, as well as what kind of learning resources students want to learn. The results of the analysis from educators are the lack of variety in the use of teaching materials in learning, the density of learning materials causes educators to have difficulty in pursuing the material presented, so educators ask students to summarize learning materials.

The analysis of students was carried out by interviewing and giving initial questionnaires, the aspects analyzed included understanding the material, and learning resources for students. The results of the analysis of students are that students do not understand physics learning because physics is difficult to understand, the use of learning resources such as textbooks does not attract students' interest in learning physics because the books are thick and there are many discussions, and the use of learning resources is less varied.

### b. *Determining Competencies or Learning Objectives*

At this stage, it is done by determining the SK, KD, indicators and learning objectives of the material to be used which is seen based on the curriculum analysis carried out in the first stage. In the development of this worksheet there are 3 learning activities where learning activity 1 consists of 4 indicators and 6 learning objectives, learning

activity 2 consists of 4 indicators and 6 learning objectives, and learning activity 3 consists of 4 indicators and 8 learning objectives.

### c. *Designing Teaching Materials*

At this stage, the design and manufacture of worksheet has a structure consisting of cover, description of worksheet, instructions for using worksheet, introduction, table of contents, and concept map of basic competencies, indicators, and learning objectives. This worksheet consists of 3 meetings and 5 sub-materials designed according to the ECIRR model with the syntax of elicit, confront, identify, resolve, and reinforce. The design is also adjusted to the KD that has been analyzed.

### d. *Producing Teaching Materials*

At this stage, a Formative Tessmer Evaluation is carried out with the following stages:

#### 1. Expert Review

At this stage the worksheet that has been designed is given to experts to get suggestions and comments. Worksheet based on Elicit Confront Identify Resolve Reinforce was validated by three experts with validator selection criteria, namely understanding and working in the field of physics studies. The validator chosen to validate this worksheet is a lecturer in the Physics Education Study Program, Universitas PGRI, West Sumatra. The following table is the result of the expert review assessment. As mentioned (Prosiding Seminar Nasional Aplikasi Sains & Teknologi (SNASTI) 2014) validity is the level of reliability and validity of the measuring instrument used. It can be said validity is the extent to which a measuring instrument is appropriate in measuring a data, in other words whether the measuring instrument used is indeed measuring something to measure. The results of the expert review can be seen in the Table 2.

**Table 2**  
*Expert Review Results*

No.	Assessment Aspect	Validation Percentage (%)	Category
1.	Content Eligibility	91.85	Very Valid
2.	Language and Images	94.07	Very Valid
3.	Presentation	96	Very Valid
4.	Graphics	94.67	Very Valid
	Average	94.15	Very Valid

The results of the validator analysis, the highest assessment aspect lies in the presentation aspect with a percentage of 96% categorized as very valid because according to the validator this worksheet is systematically arranged with material presentation, sample questions and interactive exercises that can invite students to participate in learning. The lowest percentage of the aspect lies in the aspect of content feasibility with a percentage of 91.85% because according to the validator there are several indicators that are not appropriate and need to be added an explanation to each image displayed, even though this developed worksheet is categorized as very valid. According to Riduwan (2012 :89) validity assessment is determined based on the score criteria obtained. Gradeification of validity values is said to be valid and very valid if the value is 61-100% The overall average percentage of the 3 experts which is 94.15% is categorized as very valid so the worksheet is feasible to be used and tested to the next stage.

## 2. One-to-One Trial

One-to-one product trials were conducted in grade XI IPA 2 SMA N 2 Batang Anai with the provision that 1 student was of high ability, 1 person of moderate ability, and 1 person of low ability. In the one-to-one trial, students understand the worksheet developed in terms of ease of use, aspects of the time required, aspects that are easy to interpret, and aspects that have the same equivalence. The results of the assessment from students will be analyzed as improvements to the next stage. According to Plomp and Nieveen (2013) states that measuring the level of practicality is seen from whether educators (and other experts) consider that the material is easy and can be used by educators and students. After that students were asked to provide assessments, comments and suggestions from worksheet which had been distributed on student practice sheets to be revised according to suggestions. One-to-one results are shown in Table 3.

The results of the one-to-one practicality analysis obtained the highest score in the easy-to-interpret aspect with a percentage of 96.67% categorized as very practical, this means that the worksheet developed is interesting to be used as a tool for teaching and learning activities on the material of rotational dynamics and rigid body balance. The aspect of the assessment that has the lowest value, namely the aspect of time required with a percentage of 90%, is categorized as very practical, because the material contained has many subjects and the material is quite dense. Based on the results

of the one-to-one assessment, it was found that the suggestions from students that this worksheet needed to be added were sample questions so that students could understand the material better. The overall average percentage is 92.92% with a very practical category.

**Table 3**  
*One-to-One Results*

No	Assessment Aspect	Practicality Percentage (%)	Category
1.	Ease of Use	91.67	Very Practical
2.	Time required	90	Very Practical
3.	Easy to Interpret	96.67	Very Practical
4.	Have the same Equivalence	93.33	Very Practical
Average		92.92	Very Practical

### e. Involve students in using teaching materials

Small group trials were conducted on students of grade XI IPA 2 SMA N 2 Batang Anai which consisted of three students of high ability, three students of medium ability, and three students of low ability. After distributing the worksheet that has been revised from a one-to-one trial, then students understand the worksheet, give assessments, comments and suggestions to the worksheet on the student's practicality sheet to be revised according to suggestions. Small group results are shown in Table 4.

**Table 4**  
*Small Group Results*

No.	Assessment Aspect	Practicality Percentage (%)	Category
1.	Ease of Use	86.94	Very Practical
2.	Time required	86.67	Very Practical
3.	Easy to Interpret	88.89	Very Practical
4.	Have the same Equivalence	88.89	Very Practical
Average		87.85	Very Practical

The small group test used was the division of research subjects, where in this small group test worksheet was given to 9 students. The trial was carried out by giving worksheet to students and at the end of learning students were asked to provide assessments, comments and suggestions on worksheet. From this

assessment, the results obtained practical analysis of the small group obtained the highest score in the easy-to-interpret aspect and has the same equivalence with the percentage of 88.89% categorized as very practical, this is because the worksheet developed can help students in the learning process as well as the language used is clear and easy to understand.

The aspect of assessment that has the lowest value is the aspect of time required with a percentage of 86.67%, even though this worksheet is categorized as very practical. Based on the results of the small group assessment, suggestions from students were obtained for some pictures at the simple experimental stage to be displayed more clearly. The overall average percentage is 87.85% with a very practical category. From this analysis, it can be concluded that the worksheet based on Elicit Confront Identify Resolve Reinforce is easy to use as teaching material but there are still revisions so that it can be continued to the next stage.

#### f. Evaluate and revise teaching materials

At this stage, a field test is conducted. Field test trials are carried out after making revisions based on small group trials. This field test trial was carried out on 1 educator and 28 students of grade XI IPA SMA N 2 Batang Anai. The field test was carried out to test the practicality of worksheet based on Elicit Confront Identify Resolve Reinforce. Field test results are shown in Table 5.

**Table 5**  
*Field Test Results*

No	Assessment Aspect	Practicality Percentage (%)	Category
1.	Ease of Use	91.62	Very Practical
2.	Time required	93.75	Very Practical
3.	Easy to Interpret	95.35	Very Practical
4.	Have the same Equivalence	96.43	Very Practical
	Average	94.29	Very Practical

Practicality is the level of practicality and ease of use of something products for students. In this study, researchers the results of practicality products by teachers and students which are the variables to be analyzed (Setiyatna 2022). At this stage a practicality test was carried out in the form of a field test, where

the field test was a research subject consisting of 28 students. The practicality test is carried out by giving worksheet to students and at the end of learning students are asked to provide assessments, comments and suggestions on worksheet through a practical questionnaire. The results obtained in this study were adjusted to the research objectives. The results of the practical analysis of the field test obtained the highest score in the aspect of having the same equivalence with a percentage of 96.43% categorized as very practical, students stated that this worksheet is easy to use and easy to understand. The aspect of the assessment that has the lowest value, namely the aspect of time required with a percentage of 91.62%, is categorized as very practical. The overall average percentage is 94.29% with a very practical category.

In Line With The Results Of Research Conducted By Sya'bani 2020, Entitled Development Of The Material Science Module Based Vibration And Sound ECIRR (Elicit, Confront, Identify, Resolve, Reinforce) Integrated Al - Qur'an In Class, from this study the practicality results were obtained for the ECIRR-based science module integrated with the Qur'an in class material on wave and sound vibrations at SMPN 1 Lintau Buo obtained very practical criteria with a percentage of 87.66 % very practical criteria. The results of the teacher's response questionnaire to practicality to the ECIRR-based science module integrated with the Al-Qur'an in class VIII materials on wave and sound vibrations at SMP N 1 Lintau Buo obtaining very practical criteria with a percentage of 83.33% criteria very practical.

From these results, it can be seen that the worksheet based on Elicit, Confront, Identify, Resolve, Reinforce, which was developed is already worth it use in learning physics. This is concluded from the results of the validator, the response of educators and students in using worksheet. According to Umbaryati (2016 : 216) Student worksheets are a means to assist and facilitate teaching and learning activities so that effective interactions are formed between students and educators, can increase student learning activities and achievements (Permatasari & Trisnawati, 2021). So it can be concluded that worksheet based on Elicit Confront Identify Resolve Reinforce can invite students to be directly involved in the learning process, especially learning physics.

## Conclusions

Development of teaching materials in the form of worksheet based on Elicit Confront Identify Resolve Reinforce for grade XI IPA students at SMA N 2

Batang Anai on Rotational Dynamics and Rigid Body Balance material can assist educators in providing physics learning. This study uses the ASSURE development model which is equipped with the Tessmer Formative Evaluation stages. The results of the validity of the developed worksheet are categorized as very valid with a percentage of 94.15%. The validity of worksheet is illustrated from the validation results on 4 validation aspects, namely the content feasibility aspect, language and image aspects, presentation aspects and graphic aspects. This worksheet is also categorized as very practical in the practicality test from educators and some students with a percentage of 90.24%. The practicality of worksheet is seen from the results of the practicality of worksheet, namely aspects of ease of use, aspects of time needed, aspects that are easy to interpret, and aspects that have the same equivalent. Based on the data obtained, the development of worksheet based on Elicit Confront Identify Resolve Reinforce is categorized as valid and practical.

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